Journal of the American College of Cardiology
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Published by Elsevier Science Inc.

Vol. 34, No. 6, 1999
ISSN 0735-1097/99/$20.00
PII S0735-1097(99)00416-7

EDITORIAL COMMENT

Assessing the Quality of Medical Diagnosis*

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Both physicians and patients consider the quality of care to be of great importance in the practice of medicine. Although most of us think that we can recognize when we are providing or receiving high quality care; in fact, there are few objective methods for assessing the quality of medical care. Evaluation of quality is a particular problem for diagnostic tests, such as echocardiography.

Medical education and training. The traditional approach to ensuring high quality medical care has focused on the training and credentials of individual physicians. Accreditation of cardiology fellowship programs by the Accreditation Council for Graduate Medical Education provides assurance that current standards are met for the length, content and quality of education and training (1). The program

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director provides verification that each physician has demonstrated clinical competency in clinical cardiology, including transthoracic echocardiography. After completion of an accredited program, individual physicians are certified by passing the American Board of Internal Medicine Cardiovascular Disease Subspecialty Examination (2). In addition, both the American Society of Echocardiography and a conjoint committee of the American Heart Association and American College of Cardiology have provided specific guidelines on recommended numbers of procedures to be performed under the supervision of a qualified physician to document competence in echocardiography (3,4). Recently, an additional examination—the ASEeXAM—has become available for both cardiologists and other physicians using echocardiography in clinical practice to document their expertise with this procedure (5). Similar accreditation and credentialing mechanisms for the education, training and clinical competency of cardiac sonographers ensure acquisition of high quality echocardiographic data.

Verification of training, certification and numbers of procedures are used by most medical centers in determining whether an individual physician is allowed hospital privileges in echocardiography. Clearly, this approach to ensuring high quality medical care remains the standard for the initial evaluation of the physician seeking clinical privileges in echocardiography.

Continued physician competence. However, approaches to ensuring continued high quality care are more problematic. One approach is to require a set number of hours of continuing medical education annually. Another approach is periodic board certification, as is required now for many specialities. Repeated examination differs from initial certification in that typically verification of competence based on direct observation of clinical skills by the program director is no longer required. There is little data on whether the ability to pass a written examination, in the absence of direct observation of clinical skills, ensures competence in a diagnostic procedure such as echocardiography. The most common approach to renewing hospital privileges is to require performance of a designated number of procedures per year. Obviously, the number of procedures is meaningless, unless there is assurance that the procedures have been performed and interpreted correctly. Despite these limitations, the current model for quality assurance in diagnostic procedures at most medical centers is based on this approach.

Evaluation of clinical outcomes. Instead of focusing on the qualifications of the physician, an alternate approach to quality assurance has been to evaluate clinical outcomes. For surgical or medical therapeutic procedures, potential quality measures include risk-adjusted mortality, morbidity, hospital length-of-stay and patient satisfaction. Adherence to published therapeutic guidelines in specific patient groups also can be assessed (6).

For diagnostic procedures, quality can be evaluated based on the sensitivity and specificity (e.g., diagnostic accuracy) of the test. This approach is used for the initial validation of a new test at research centers and can be used to a limited extent by individual echocardiography laboratories by tracking those patients who undergo complementary diagnostic tests or subsequent surgical procedures. However, a comprehensive evaluation of diagnostic accuracy rarely is feasible in clinical practice, given the costs and potential risks of redundant testing. Diagnostic accuracy also can be evaluated by review of a sample of cases by an independent expert (7). This approach has an inherent sampling bias, is likely to miss conditions that have a low prevalence in the population and relies on the availability and willingness of "independent experts." Peer ratings have been used to evaluate physician clinical skills but have not yet been applied to the quality of diagnostic tests, such as echocardiography (8).

Epidemiologic approach to quality assessment. In this issue of the *Journal*, Berger et al. (9) propose a unique approach to evaluating the quality of diagnostic echocardi-

*Editorials published in the *Journal of the American College of Cardiology* reflect the views of the authors and do not necessarily represent the views of *JACC* or the American College of Cardiology.

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JACC Vol. 34, No. 6, 1999
November 15, 1999:1837–8

ography based on actual practice patterns. Specifically, they used business methods of statistical analysis to assess the uniformity of echocardiographic interpretation. In this study, product uniformity was defined by the inter-reader differences in the diagnostic prevalence of four echocardiographic findings: a regional wall motion abnormality, left ventricular thrombus, mitral valve prolapse and valvular vegetation. As the data convincingly demonstrate, there were significant differences between readers for these diagnoses and these differences persisted even after adjustment for study group characteristics.

There are several strengths of this statistical approach to quality evaluation. First, it allows ongoing quality assessment using existing data bases, and thus is timely and inexpensive. Second, it is of value for uncommon, as well as common, echocardiographic abnormalities, as illustrated by disease prevalences ranging from 0.4% to 12.7% in the current study. Third, it allows for statistical adjustment for differences in patient characteristics and assignment bias.

However, it must be kept in mind that the validity of this statistical approach depends on a study group that is large enough for statistical analysis. Case-mix over time (the "input") must be equal for each physician or must be adjusted for in the analysis. In addition, these echocardiographic diagnoses (the "output") are assumed to be a relevant measure of quality. Importantly, including the degree of diagnostic certainty in the analysis allows evaluation of variation among physicians in the *threshold* for a specific diagnosis, as illustrated by the analysis of suspected versus unequivocal mitral valve prolapse.

The major limitation of this epidemiologic approach to quality assessment is that while it identifies physician variability in interpretation of echocardiographic data, it does not indicate which interpretation is correct. Specifically, is the problem underdiagnosis by one physician or overdiagnosis by the other physician? Or is the true disease prevalence somewhere in between? Improvement in echocardiographic quality will depend on review of diagnostic criteria and clinical accuracy by the group of physicians, with subsequent re-review of interphysician variability after agreement on appropriate diagnostic criteria. As Berger et al. (9) note, documentation of diagnostic variability only "targets opportunities for subsequent quality improvement."

Challenge for the future. As this new approach demonstrates, we now are at the point where competency-based measures of the quality of clinical care are feasible. The challenge will be to make the switch from the current "testing and numbers" approach for verification of clinical skills to a new approach with ongoing evaluation of clinical competence based on physician practice patterns and clinical outcomes. Although accreditation of training programs, certification of individual physicians and documentation of procedural numbers will remain the mainstays of the initial credentialing process, ongoing competency will depend less on "testing and numbers" and more on objective measures of the quality of care provided by that physician. To make this transition successfully, we need to develop measures of quality that are easy to implement, continuously acquired, inexpensive to measure, and provide accurate measures of clinical quality, even when the prevalence of disease is low. The study by Berger et al. (9) is a step in the right direction. Hopefully, studies demonstrating how this approach can improve diagnostic quality, and the application of this approach to other diagnostic tests, will be forthcoming.

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